BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images,
Please do not report the images to the
Image Problem Mailbox.

2731

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Jose Luis GONZALEZ DE PRADO

Attorney Docket Q59609

Appln. No.: 09/598,896

Group Art Unit: 2731

Filed: June 22, 2000

Examiner: Not yet assigned

For: METHOD AND SYSTEM FOR MULTIPLE ACCESS IN A RADIOCOMMUNICATION SYSTEM

SUBMISSION OF PRIORITY DOCUMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith is a certified copy of the priority document on which a claim to priority was made under 35 U.S.C. § 119. The Examiner is respectfully requested to acknowledge receipt of said priority document.

Respectfully submitted,

SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3212
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

J. Frank Osha
Registration No. 24,625
for
David J. Cushing
Registration No. 28,703

Enclosures: **CERTIFIED COPY OF EUROPEAN APPLICATION NO. 99500108.8**
Date: AUG 25 2000

09/598,896
Q59609
1881

Europäisches Patentamt | European Patent Office | Office européen des brevets

Bescheinigung | Certificate | Attestation

Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.

The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

99500108.8

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

I.L.C. HATTEN-HECKMAN

DEN HAAG, DEN
THE HAGUE, 26/06/00
LA HAYE, LE

Europäisches Patentamt
European Patent Office
Office européen des brevets

Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

Anmeldung Nr.:
Application no.:
Demande n°: 99500108.8

Anmeldetag:
Date of filing:
Date de dépôt: 25/06/99

Anmelder:
Applicant(s):
Demandeur(s):
Alcatel Espana, S.A.
28045 Madrid
SPAIN

Bezeichnung der Erfindung:
Title of the invention:
Titre de l'invention:
Method and system for multiple acess in a radiocommunication system

In Anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)

Staat: State: Pays:	Tag: Date: Date:	Aktenzeichen: File no. Numéro de dépôt:

Internationale Patentklassifikation:
International Patent classification:
Classification internationale des brevets:
H04Q7/32

Am Anmeldetag benannte Vertragstaaten:
Contracting states designated at date of filing: AT/BE/CH/CY/DE/DK/ES/FI/FR/GB/GR/IE/IT/LI/LU/MC/NL/PT/SE
Etats contractants désignés lors du depôt:

Bemerkungen:
Remarks:
Remarques:

METHOD AND SYSTEM FOR MULTIPLE ACCESS IN A RADIOCOMMUNICATION SYSTEM

OBJECT OF THE INVENTION

The present invention relates to a method for allocating the radio and signalling resources, in general, of a multiple access radiocommunication system, which comprises a set of fixed units such that each of them has an coverage area or cell associated with it. Within each cell are located a plurality of remote units, which employ time division multiple access (TDMA) techniques for communicating with their fixed unit.

The multiple access method is of special, but not exclusive, application in a point-to-multipoint radiocommunication system, so that the allocation of the different time slots that constitute a frame, in the uplink direction of the communication, is carried out in a dynamic mode as a function of the traffic requirements of each of the remote units that constitute the radiocommunication system.

STATE OF THE ART

A radiocommunication system is divided into a plurality of cells, and each cell comprises a fixed unit normally connected by means of a cable network to a telephone transport network such as a public switched telephone network (PSTN).

Each fixed unit has associated a coverage area inside which it establishes communications via radio with those remote units located within its coverage area, by using time division multiple access (TDMA) techniques, that is, the frequency band is divided into time slots which are assigned to the sending and receiving of signals. Consequently, a number of communications can be transmitted simultaneously in a single frequency band.

In a conventional point-to-multipoint radiocommunication system, each remote unit transmits, in the uplink direction of the communication, in addition to the data bursts corresponding to the communications already established, signalling information relative to both the communications that are already established and to the new ones arising in the remote units.

This gives rise to the appearance within a TDMA frame of one or more time slots reserved for signalling, which have to be shared among all the remote units.

A commonly employed method consists in the cyclic allocation of usage times for these signalling slots in an inflexible manner as a function of the identity of each remote unit, in the form of a signalling multiframe.

In this way, each remote unit must wait for its signalling time to appear for sending a limited message, limited in length because the signalling channel is shared among all the remote units in an inflexible manner regardless of whether they require to signal or not. Thus, although a remote unit has no message to send, it has to occupy the allocated time, for example, with a stuffing message.

Similarly, if a remote unit has several messages to send, it must wait for successive turns in order to transmit the information in question, even although there are time slots in the same frame which are filled with stuffing information, that is there is an inflexible turn or order.

Consequently, a fixed unit will be able to communicate simultaneously with as many remote units as there are time slots for signalling in the signalling multiframe in the uplink direction of the communication.

As a consequence, it is necessary to provide a method whereby the number of remote units that can occupy the signalling multiframe is increased, without excessively increasing the number of time slots into which the signalling multiframe is divided, which would result in unacceptable delay times.

CHARACTERISATION OF THE INVENTION

The proposed multiple access method for a radiocommunication system overcomes the problems above indicated.

The radiocommunication system has its coverage area divided into a plurality of cells, so that within each cell there is at least one fixed unit that communicates with a plurality of remote units located inside the cell.

The access method avoids forming a signalling multiframe working with a fixed turn for transmitting. To this end, the fixed unit broadcasts over a pilot channel a predetermined number of virtual identities for signalling and that form the signalling multiframe, so that when a remote unit wishes to transmit information in the uplink direction, it selects one of the virtual identities received.

The fixed unit comprises a first controller means that establishes the number of virtual identities and, based on their occupancy level, increases or

diminishes it. The occupancy level is a function of the traffic present at each moment.

Thus, the signalling multiframe is only used by those remote units that have messages to send. This method makes allocation of the signalling multiframe more flexible, reducing signalling delays.

In brief, the number of remote units that can communicate simultaneously with a fixed unit is a function of the number of time slots into which the signalling multiframe is divided, it not being possible to increase these indefinitely without increasing, in turn, the signalling delay. Thus, by use of the method proposed, it is possible to increase the number of remote units since the multiframe time slots are distributed among those units which have to transmit signalling to the fixed unit.

BRIEF DESCRIPTION OF THE FIGURES

A more detailed explanation of the invention is provided in the following description, based on the attached figures, in which:

- figure 1 shows a diagram of a point-to-multipoint radiocommunication system according to the invention,
- figure 2 shows a block diagram of a fixed unit according to the invention, and
- figure 3 shows a block diagram of a remote unit according to the invention.

DESCRIPTION OF THE INVENTION

Figure 1 shows a preferred embodiment of the point-to-multipoint radiocommunication system, which comprises a set of fixed units 11-1 to 11-n such that each one has associated with it a cell or coverage area of the radiocommunication system.

Each fixed unit 11-j (where j = 1, ..., n) is connected via radio with a set of remote units 12-1 to 12-m located within its coverage area. To carry out the communications between the different remote units 12-1 to 12-m and the fixed unit 11-j use is made of time division multiple access (TDM/TDMA) techniques.

The traffic generated by a remote unit 12-i (where i = 1, ..., m) is directed through the fixed unit 11-j to a telephone transport network such as a public switched telephone network (PSTN).

According to the TDM/TDMA technique, a carrier frequency is divided

into time slots that are grouped into frames, there being frames for both transmission directions. Within the TDMA frame there are time slots reserved for signalling between the fixed unit 11-j and the remote units 12-1 to 12-m, which form a signalling multiframe.

When a remote unit 12-i wishes to transmit information relative to a communication, it inserts its data bursts into an allocated time slot of the frame. The time slot allocation is carried out by a first controller means 111 belonging to the fixed unit 11-j (see figure 2).

According to the time slot allocation method proposed, the first controller means 111 incorporates an algorithm that determines a first predetermined number of virtual identities for signalling and implements it on the basis of the traffic conditions of the radiocommunication system. The virtual identities proposed form the signalling multiframe and are independent of the true identities of each remote unit 12-i, which shall be used for other purposes (management).

The virtual identities created are supplied to a first radio transmitter 112 of the fixed unit 11-j to be broadcast over a pilot channel, being received in the remote unit 12-i by means of a second radio receiver 123.

Thus, when a subscriber connected to a remote unit 12-i wishes to transmit a signalling message, for example in order to set up a communication, the remote unit 12-i selects one of the virtual identities available, independently of its true identity, by employing a second controller means 121 (see figure 3).

The second controller means 121 receives from the second radio receiver 123 the proposed identities and makes the selection of one of them on the basis of traffic requirements and on the nature of the information to be transmitted, be this voice, data, video, television or other digital signal. The duration of traffic bursts is therefore variable.

The virtual identity selected shall indicate the order of transmission within the signalling multiframe. Thus, the remote unit 12-i shall start to transmit, by means of a second radio transmitter 122, signalling messages in the time slot allocated within an uplink frame. The number of virtual identities conditions the duration of the signalling multiframe, there being a maximum duration permitted.

A first radio receiver 113 of the fixed unit 11-j receives the signalling

message and feeds it to the first controller means 111, which analyses it and records the virtual identity occupied.

The occupancy of this virtual identity is transmitted over the broadcast channel in order to prevent it being used by another remote unit 12-k, consequently, the signalling multiframe becomes reduced and shall try to occupy another virtual identity of the signalling multiframe.

When a signalling process is over, the virtual identity is once again made available for selection for another communication, and so on successively. The signalling multiframe is dynamic; that is, it is organised as a function of the number of virtual identities proposed at any given moment.

If the virtual identities proposed by the fixed unit 11-j are gradually taken up, the first controller means 111 increases the number of proposed virtual identities within the signalling multiframe. Consequently, the duration of the signalling multiframe increases and the spacing between bursts corresponding to a given communication also increases. As the signalling processes are gradually concluded, the first controller means 111 reduces the number of virtual identities proposed within the signalling multiframe.

During system start-up, and while a given traffic situation exists, the first controller means 111, by default, establishes a reduced number of virtual identities for selection by the remote units 12-1 to 12-m. For example, if the virtual identities 1 to 4 are put into play, a four time slots multiframe is obtained.

Thus, in the case where there is only one remote unit 12-i with a call set-up process in course, it will choose one of the identities in play and will make use of the corresponding time slot. Since there are only four time slots, the multiframe duration is short, and the bit flow that the remote unit 12-i enjoys is high.

The multiframe duration (time between consecutive bursts transmitted from the same remote unit 12-i), gradually increases as virtual identities are added in order to permit signalling from more remote units 12-1 to 12-m, and, in addition, the duration of the burst from each of the remote units 12-1 to 12-m diminishes.

As the radio resources of the system are released, the fixed unit 11-j puts the released virtual identities into play again, to be assigned to new calls and thereby avoid having to introduce more virtual identities than those

necessary, which would lengthen the duration of the multiframe needlessly.

The fixed unit 11-j transmits, over the broadcast channel, the virtual identities that are presently occupied, with an input acknowledgement message. The remote unit 12-i that detects this acknowledgement message, shall continue to use its virtual identity and the corresponding time slot, while the rest shall interpret this as a warning of virtual identity and time slot occupancy.

In the event that another remote unit 12-k wishes to initiate a call set-up process, it shall select another virtual identity available. If two remote units 12-i and 12-k coincide in the use of the same virtual identity, and consequently of the same time slot, the fixed unit 11-j detects this collision and broadcasts a "not confirmed" message for the right to employ said virtual identity and time slot. The remote units 12-i and 12-k that tried to gain access, decline to use said virtual identity and time slot, open a time-out period and opt for the virtual identities proposed at that moment.

CLAIMS

1. - **Method for multiple access in a radiocommunication system** that employs time division multiple access (TDMA) techniques, such that a signalling multiframe is used, in both transmission directions, for interchanging signalling messages between at least one fixed unit (11-j) and a set of remote units (12-1 to 12-m) located within the coverage area associated with said fixed unit (11-j); **characterised** in that said signalling multiframe is formed by a predetermined number of virtual identities for signalling generated by a first controller means (111), included in said fixed unit (11-j), for the purpose of interchanging signalling messages so that the number of said virtual identities is less than the number of said remote units (12-1 to 12-m).

2. - **Method for multiple access** according to claim 1, **characterised** in that said virtual identities are independent of the true identities of said remote units (12-1 to 12-m) and are broadcast by a first radio transmitter (112), included in said fixed unit (11-j), over a pilot channel in the downlink transmission direction.

3. - **Method for multiple access** according to claim 2, **characterised** in that said pilot channel is received by means of a second radio receiver (123), included in a remote unit (12-i), being fed to a second controller means (121) for recording the predetermined number of virtual identities for signalling.

4. - **Method for multiple access** according to claim 3, **characterised** in that a virtual identity is selected by said second controller means (121) when said remote unit (12-i) wishes to transmit a signalling message via a second radio transmitter (122), for which purpose it inserts the signalling message into the virtual identity selected and it is received in a first radio receiver (113), included in said fixed unit (11-j).

5. - **Method for multiple access** according to claim 4, **characterised** in that said signalling multiframe received in said first radio receiver (113) is supplied to said first controller means (111) in order that said selected virtual identity be marked as occupied and thereafter is broadcast by means of said pilot channel.

6. - **Method for multiple access** according to any one of claims 1 to 4, **characterised** in that said signalling multiframe is formed by a

maximum number of virtual identities for signalling that is a function of the maximum duration permissible for said signalling multiframe.

7. - Method for multiple access according to claim 6, **characterised** in that the number of virtual identities for signalling generated by said first controller means (111) is a function of the level of occupancy of said signalling multiframe.

8. - System for multiple access in a radiocommunication system which comprises at least one fixed unit (11-j) having an associated coverage area within which is located a set of remote units (12-1 to 12-m), such that they employ time division multiple access (TDMA) techniques to establish communications, so that they interchange signalling messages by means of a signalling multiframe that is used in both transmission directions; **characterised** in that said fixed unit (11-j) comprises a first controller means (111) for generating a predetermined number of virtual identities for signalling, these being grouped in said signalling multiframe, so that the number of said virtual identities is less than the number of said remote units (12-1 to 12-m).

9. - System for multiple access according to claim 8, **characterised** in that said fixed unit (11-j) comprises a first radio transmitter (112) for broadcasting said virtual identities over a pilot channel in the downlink direction of the transmission, such that said virtual identities are independent of the true identities of said remote units (12-1 to 12-m).

10. - System for multiple access according to claim 9, **characterised** in that said remote unit (12-i) comprises a second radio receiver (123) for receiving said pilot channel, that is supplied to a second controller means (121) for recording the predetermined number of virtual identities for signalling.

11. - System for multiple access according to claim 10, **characterised** in that said second controller means (121) is adapted for selecting a virtual identity when said remote unit (12-i) wishes to transmit a signalling message so as to insert the signalling message inside the virtual identity selected, so as to be transmitted by a second radio transmitter (122) so that a first radio receiver (113), included in said fixed unit (11-j), receives said signalling message.

12. - System for multiple access according to claim 11,

characterised in that said first radio receiver (113) is adapted for supplying said first controller means (111) with said signalling multiframe, in order that said selected virtual identity is marked as occupied and thereafter is broadcast over said pilot channel.

13. - System for multiple access according to any one of claims 8 to 12, **characterised** in that said first controller means (111) is adapted for generating a number of virtual identities for signalling as a function of the level of occupancy of said signalling multiframe, so that there is a maximum number of virtual identities for signalling which is a function of the maximum duration permissible for said signalling multiframe.

ABSTRACT

Method and system for multiple access in a radiocommunication system

Method for multiple access in a radiocommunication system which avoids forming a signalling multiframe with an inflexible turn of transmission. A fixed unit (11-j) broadcasts over a pilot channel a predetermined number of virtual identities for signalling which form the signalling multiframe, so that when a remote unit wishes to transmit, it selects one of the virtual identities received.

The time slots in the signalling multiframe are distributed among those remote units (12-1 to 12-m) which have signalling messages to transmit to the fixed unit (11-j).

(Figure 1)

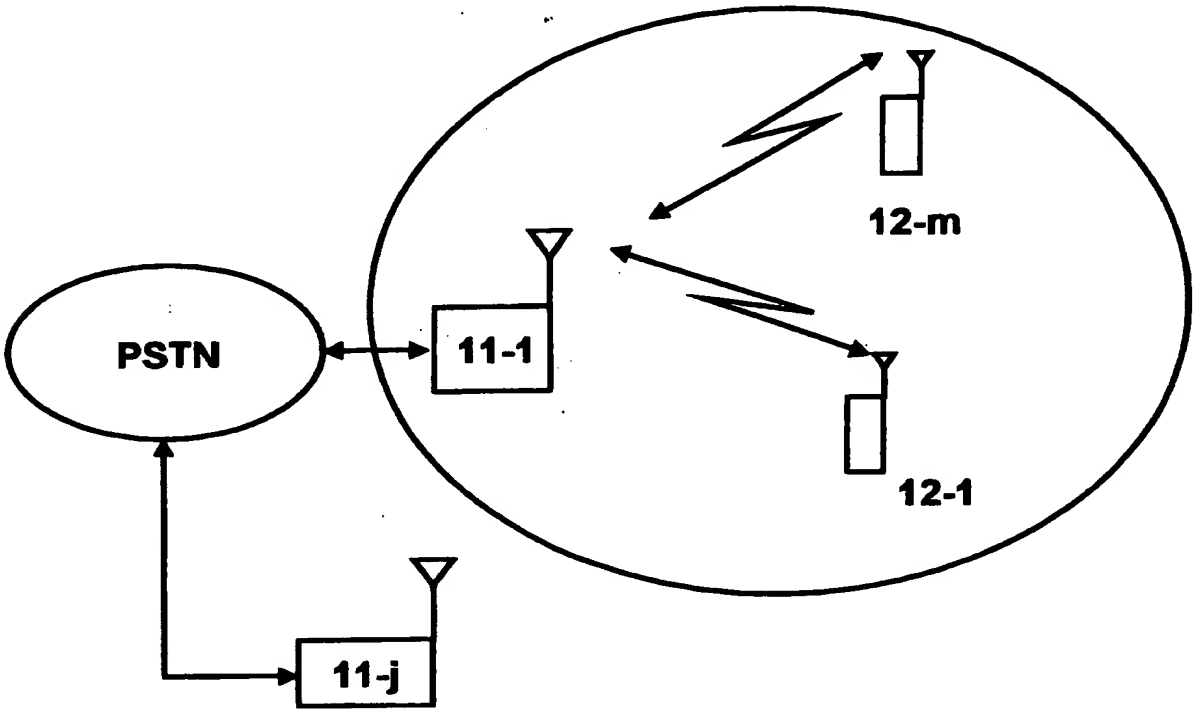

FIG. 1

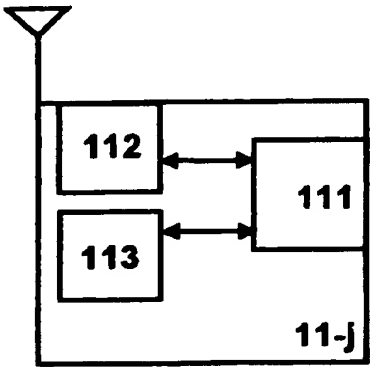

FIG. 2

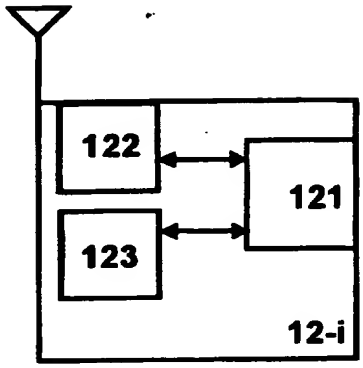

FIG. 3